Regulatory Impact Analysis of the Final Rule for a 180-Day Accumulation Time for F006 Wastewater Treatment Sludges

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1.0 EXECUTIVE SUMMARY

As an outgrowth of the U.S. Environmental Protection Agency's (EPA) Common Sense Initiative, EPA is promulgating a regulation to allow large quantity generators of the listed hazardous waste F006 (wastewater treatment sludge from electroplating operations) to accumulate this waste on site for up 180 days and in certain instances, up to 270 days without a RCRA permit. The Agency is promulgating this rule to promote increased recovery of metals from F006 sludges. The expected effects of this regulatory modification include decreased costs associated with handling and transporting F006 and possibly an increase in costs associated with accumulating F006 compared to the costs associated with current storage and transportation management practices employed by most generators of F006. This Regulatory Impact Analysis (RIA) assesses the likely regulatory impacts associated with this final rule provide the generator with a 180 day or 270 day accumulation time limit. Costs and economic impacts and the expected benefits associated with this accumulation period are assessed. Facility-specific data on current F006 generation and management practices were obtained from the EPA 1995 Biennial Reporting System (BRS).

Executive Order No. 12866 requires that regulatory agencies determine whether a new regulation constitutes a significant regulatory action. The estimated costs and potential economic impacts of this final rule to provide the 180 accumulation period for generators of F006 indicate this final rule is not a significant regulatory action as defined by the Executive Order. The action is estimated to result in a potential savings to generators of F006 of between $4.2 million and $5.3 million annually and therefore will not have an annual effect on the economy of $100 million or more. Nor, does the rule adversely affect the economy, a sector of the economy, productivity, competition, jobs, the environment, health or public safety.

Two options were considered for this rule. The first option would allow the accumulation of F006 up to 16,000 kilograms (17.7 tons). Under this waste accumulation option, this final rule potentially affects 1,395 electroplating facilities that currently generate less than 70.8 tons of F006 wastewater treatment sludge per year and are classified as large quantity generators under RCRA (LQGs, i.e., generators that generate more than 1000 kg. of hazardous waste per calendar month). The second option would allow the accumulation of up to 20,000 kilograms (22 tons) of F006, and would potentially affect 1,483 electroplating LQGs that generate less than 88 tons of F006 per year.

Under RCRA, LQGs are allowed to accumulate hazardous wastes for a period up to 90 days on site without obtaining a RCRA permit. An LQG would potentially benefit from a modification to this rule that allows generators to accumulate F006 for up to 180 days (or 270 days when waste must be shipped more than 200 miles to a recycling facility) prior to sending the waste off-site for management. Collectively, generators of F006 ship more than 29,000 tons of F006 waste off site per year under Option 1 and more than 36,000 tons per year under Option 2. According to BRS data, approximately 40 percent of this quantity is currently shipped to metals recovery facilities with most of the remaining waste disposed in landfills.

Under Option 1, two scenarios based upon projected recycling rates are evaluated to estimate the potential cost savings associated with the to provide the generator a 180 accumulation period. EPA predicts, based upon industry input through the CSI process that the effect of the accumulation period will be to increase post-regulatory recycling rates. Under the first scenario, a lower bound recycling rate is estimated to be between 70 and 80 percent of the F006 generated across different generator size categories. The resulting total cost savings associated with reduced waste management and transportation cost are estimated to be $3.9 million per year. For the second scenario, EPA estimated an upper bound recycling rate of 85 to 100 percent of F006 generated across different generator size categories. The resulting total cost savings are estimated to be $5.0 million per year. Total cost savings therefore are estimated to range from $3.9 to $5.0 million annually on a before-tax basis. As a result of these cost savings, the recycling rate of affected facilities (LQGs generating less than 70.8 tons per year) is expected to increase, ranging from 71 to 87 percent.

Under Option 2, a similar approach with lower and upper bound scenarios is used to estimate cost savings. Under the lower bound scenario, the recycling rate is estimated to be between 70 and 80 percent of the F006 generated across different generator size categories. The resulting total cost savings associated with reduced waste management and transportation cost are estimated to be $4.2 million per year. For the second scenario, EPA estimated an upper bound recycling rate of 80 to 100 percent of F006 generated across different generator size categories. The resulting total cost savings are estimated to be $5.3 million per year. Total cost savings therefore are estimated to range from $4.2 to $5.3 million annually on a before-tax basis. As a result of these cost savings, the recycling rate of affected facilities (LQGs generating less than 88 tons per year) is expected to increase, ranging from 72 to 89 percent.

The greatest cost reductions are expected to be realized by the facilities that generate the smallest volume of waste, those facilities generating less than 40 tons of F006 waste per year. This would include job shops (facilities which provide electroplating services on a contract or job basis) as well as small captive plating shops.

This analysis also describes the Agency's consideration of the Regulatory Flexibility Act, the Unfunded Mandates Reform Act, the Paperwork Reduction Act, the National Technology Transfer and Advancement Act, Executive Order 12875 (Enhancing the Intergovernmental Partnership), Executive Order 13045 (Protection of Children from Environmental Health Risks and Safety Risks) and Executive Order 12898 (Environmental Justice).

Providing a 180 day length of time that generators may accumulate F006 waste on site, will make it more economical for a greater number of generators to recycle F006 waste instead of placing it in a landfill. Savings to generators may result in two ways. First, the ability to accumulate a greater amount of waste will allow more generators to surpass minimum load charges and second, for many generators the number of loads (i.e., trips to a recycling facility during a given year) may be reduced, resulting in lower transportation and shipping costs.

Additionally, increased recycling of F006 waste may result in a net benefit to both society and the environment. Some of the expected potential benefits include lessening the future burden on landfill capacity; conserving scarce metal resources which provides environmental benefits in terms of energy savings, reduced volumes of waste, reduced disturbance to land, and reduced pollution; and lessening the dependance of the United States on foreign metal supplies and increasing recovery of the strategic metal chromium.[1]

[1] A strategic metal is a metal which is required for critical military and/or civilian use and for which the United States is dependent upon from vulnerable sources of supply.

2.0 INTRODUCTION

This RIA presents a cost and economic impact analysis corresponding to the final rule to provide for a 180 day accumulation period for generators of F006 wastewater treatment sludges. This action is an outgrowth of EPA's Common Sense Initiative. The expected effects of this regulatory modification include decreased costs to generators for handling and transporting F006 sludges and possibly an increase in the costs associated with expansion of the accumulation area compared to current storage and transportation management practices incurred by most firms in the affected industry.

Executive Order No. 12866 (58 FR 51735, October 4, 1993) requires that regulatory agencies determine whether a new regulation constitutes a significant regulatory action. A significant regulatory action is defined as an action likely to result in a rule that may:

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities;

- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in Executive Order 12866.

This analysis is designed to address the first factor listed above. To accomplish this, EPA estimated the costs and potential economic impacts upon generators of F006 of this regulatory modification to the accumulation time limit for F006 wastes to determine if it is a significant regulatory action as defined by the Executive Order.

2.1 Purpose

Wastewater treatment sludges from electroplating operations, EPA hazardous waste number F006, represents one of the largest untapped metal-bearing listed secondary materials amenable to metal recovery in the United States. In spite of the fact that these sludges contain a large concentration of recoverable metals, a number of regulatory and non-regulatory factors (e.g., cost, perceived liability risk, and market price of virgin metals) have resulted in a relatively low recovery rate. This regulatory impact analysis (RIA) assesses the costs and benefits of relieving one of the regulatory burdens that elecroplaters claim inhibits metal recovery from F006 sludges. EPA is finalizing this rule to allow generators to accumulate wastewater treatment sludges from electroplating operations for a period of up to 180 days without obtaining a permit or without having interim status for their storage activities (40 CFR Part 262). This final rule to allow generators to accumulate sufficient quantities of sludge for recycling and therefore encourage environmentally sound recovery of metals from this material. Generators who must transport F006 sludge over 200 miles to a recycling facility would be able to accumulate F006 for up to 270 days to encourage environmentally sound recovery of metals from this material. However, generators may accumulate no more than a specified amount of F006 waste on-site at any one time.[2]

This analysis estimates how facilities in the electroplating industry may economically benefit from this final rule, as well as how the electroplating industry as a whole may be affected. Estimates of the cost effects of the regulation were determined on both a facility-specific and industry-wide basis.

2.2 Scope of Study

The scope of the study is an assessment of the potential impacts that will be borne by the electroplating industry, for which new accumulation times under Part 262 of RCRA are being proposed. This industry produces plated metal products for a wide variety of industries, although the automotive, electronics, and consumer durable industries are the most prevalent.[3]

Data from the 1995 Biennial Reporting System (BRS) were used to complete this analysis. A total of 1,934 electroplating facilities (SIC 3471) submitted a 1995 Biennial Report on their F006 sludge generation and waste management practices. The total amount of waste generated by these facilities in 1995 was nearly 233,000 tons.

It should be noted that small quantity generators (SQGs, i.e., generators who generate less than 1,000 kilograms of hazardous waste in a calendar month) are not required to complete a Biennial Report. Therefore, the BRS data used in this analysis under represents the total number of electroplating facilities currently generating F006 waste. It may also underestimate the number of electroplating facilities affected by the final rule. Other sources provide the following information on the industry:

- Information available from the Common Sense Initiative report indicates that the metal finishing industry consists of more than three thousand job shops and more than eight thousand captive shops.

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[2] Two F006 accumulation scenarios are examined: the first limits accumulation of F006 to 17.7 tons; the second looks at impacts allowing accumulation of 22 tons of F006.

[3] U.S. EPA, Office of Enforcement Compliance Assurance, “EPA Office of Compliance Sector Notebook Profile of the Fabricated Metal Products Industry.”

- An earlier study, *Analysis of the Recycling Incentives Created by Proposed Statutory Changes to RCRA-F006 Case Study*, concluded that there were an estimated 13,000 job and captive electroplating shops in the U.S. in 1979.

- The Census Bureau, 1992 Census of Manufacturers reported that there were 3,294 plating and polishing establishments (SIC 3471) in the U.S. in 1992 (which includes job shops, but not captive shops).

Two separate waste accumulation options are considered in this analysis. The first option is to allow the accumulation of up to 16,000 kilograms (17.7 tons) of F006; under the second option this accumulation limit is increased to 20,000 kilograms (22 tons). In effect, under the first option, only facilities generating less than 70.8 tons of F006 per year would benefit from the final rule. Under the second option, only facilities generating less than 88 tons of F006 per year would benefit from the final rule. The following discussion focuses on the generator community who would benefit from the two waste accumulation options separately.

Option 1

Of the 1,934 electroplating facilities that completed the BRS, approximately 28 percent (539 facilities) are "large" large quantity generators (LQGs) that generated enough sludge to ship a full load (i.e., 17.7 tons) of F006 sludges off site every 90 days or less. These generators may experience limited benefits from the 180/270 day accumulation time limit because the current 90-day accumulation period provides sufficient time for these generators to accumulate a large enough quantity of F006 to support economical recycling. Therefore, this study does not address possible benefits to large LQGs (i.e., generators who generate 17.7 tons or more F006 in 90 days) because the benefits to this category of generators are very limited. The study, instead, addresses potential reductions in compliance costs and assesses their economic impacts to the remaining 72 percent (1,395 facilities) of F006 generators referred to as "small" LQGs (i.e., generators who generate less than 17.7 tons of F006 within a 90-day period) in this analysis.[4] Small quantity generators (SQGs) (i.e., generators who generate more than 100 kilograms and less than 1,000 kilograms of hazardous waste in one calendar month) already are allowed to accumulate F006 waste for a period of up to 180 days; therefore, SQGs will not be affected by this regulatory modification. This option also considers the cost savings of allowing generators who 1) do not accumulate more than 17.7 tons of F006 in 270 days and 2) who also must ship waste off-site to a metals recovery facility located more than 200 miles away, to accumulate F006 waste for up to 270 days.

[4] Note: The classification of generators as "large" LQGs, and "small" LQGs presented here is for the purposes of this analysis only as does not represent Federal classification criteria.

Option 2

Of the 1,934 electroplating facilities that completed the BRS, approximately 23 percent (450 facilities) are "large" large quantity generators (LQGs) that generated enough sludge to ship a full load (i.e., 22 tons) of F006 sludges off site every 90 days or less. These generators may experience limited benefits from the 180/270 day accumulation time limit because the current 90-day accumulation period provides sufficient time for these generators to accumulate a large enough quantity of F006 to support economical recycling. Therefore, this study does not address possible benefits to large LQGs (i.e., generators who generate 22 tons or more F006 in 90 days) because the benefits to this category of generators are very limited. The study, instead, addresses potential reductions in compliance costs and assesses their economic impacts to the remaining 77 percent (1,483 facilities) of F006 generators referred to as "small" LQGs (i.e., generators who generate less than 22 tons of F006 within a 90-day period) in this analysis.[5] Small quantity generators (SQGs) (i.e., generators who generate more than 100 kilograms and less than 1,000 kilograms of hazardous waste in one calendar month) already are allowed to accumulate F006 waste for a period of up to 180 days; therefore, SQGs will not be affected by this regulatory modification. This option also considers the cost savings of allowing generators who 1) do not accumulate more than 22 tons of F006 in 270 days and 2) who also must ship waste off-site to a metals recovery facility located more than 200 miles away, to accumulate F006 waste for up to 270 days.

2.3 Limitations of Analysis

This analysis does not capture all of the variables that may affect a generator's decision to recycle or to landfill F006 sludges. A generator's decision also may be affected by factors such as the presence of multiple metals in one waste stream, total metal content, technical feasibility of recovering available metals, and CERCLA liability. This effect of these factors on the cost savings estimated in this analysis is potential understatement or overstatement the true costs savings associated with this rulemaking. EPA has accounted for this uncertainty to some extent through using a range of estimated cost savings in Chapter 5. Limitations of the analysis include the following;

- The presence of multiple metals in F006 waste may impact both the marketability and feasibility of recycling F006 waste. It is common practice for metal finishers to co-mingle rinse waters from a variety of different metal plating lines into one treatment tank, resulting in a poly-metal F006 waste precipitate. While this F006 sludge may contain recoverable levels of each metal present, commercial recyclers tend to prefer plating rinse waters of different metals to be kept separate so as to avoid having to separate the metals

[5] Note: The classification of generators as "large" LQGs, and "small" LQGs presented here is for the purposes of this analysis only as does not represent Federal classification criteria.

again into a mono-metal or bi-metal sludge.[6] In certain instances, recyclers may charge a generator a process or treatment fee for the presence of any impurities (metals considered not to be of value by the recycler) in excess of a specified concentration.[7] If the proportion of F006 modeled in estimate that is actually nonrecycleable (i.e., because of low metal content, contaminants or other) is greater than proportion modeled in this analysis as not recycled post-rule, then this estimate would overstate potential savings.

- The type and percent concentration of metals present in a generator's F006 sludge may impact the price they must pay a recycling facility to manage their waste. The price recyclers charge generators to manage F006 waste is influenced by the market price the recyclers can obtain for the metals they recover. In certain instances, an F006 waste stream with a high percentage of a valuable metal, may earn a generator a credit (i.e., the recycler pays the generator for the waste). As metal commodity prices fluctuate, the cost savings in this estimate would overstate or understate actual cost savings to affected generators depending on how these market changes affected the value of the F006 being recycled.

- Typically, recycling facilities do not accept all types of F006 waste. For certain generators the cost of transporting their waste to a recycling facility that will accept it may remain prohibitive, given the alternative of paying a landfill tipping fee even with a 180 day accumulation period. If recyclers are unable to accept a larger proportion of F006 than is modeled in this analysis, this estimate would overstate cost savings.

- Generators tend to be located closer to landfills than to recycling facilities. For the generators examined, it was noted that some are shipping their waste to a landfill located in the same city as their business. For these generators, the proximity of their business to a landfill is likely to continue to heavily influence their waste management decisions due to the savings associated with the reduced transportation costs. This limitation would result in an overestimate of cost savings if greater than accounted for in this estimate.

- The extent to which CERCLA liability might affect a generator's decision to either manage their F006 at a landfill or send the sludge to a metals recovery facility was not considered. Because both types of facilities may be designated as Superfund sites, it is indeterminate how this uncertainty may affect this estimate of cost savings.

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[6] Borst, Paul A., U.S. EPA, Office of Solid Waste, Economic, Methods and Risk Assessment Division, "Recycling of Wastewater Treatment Sludges from Electroplating Operations," F006, 18th AESF/EPA Pollution Prevention and Control Conference, January 27-29, 1997, p. 179.

[7] Lamancusa, James P.,P.E.,CEF, "Strategies at a Decorative Chromium Electroplating Facility: On-line vs. Off-line Recycling," Plating and Surface Finishing, April 1995, p.48.

- Only one type of recycling scenario was considered. This analysis is based on the costs associated with a generator who ships F006 waste to a recycling facility for metals recovery. In some cases, F006 waste is recycled by cement kilns; but, this is for the purpose of manufacturing cement which is a lower-value use of the metals contained within the sludge. Although this final rule does not pertain to cement kiln recycling of F006, this type of recycling is an alternative management for F006 sludges. Although the exact extent of F006 recycling in cement kilns is unknown, it is not believed to be substantial. This uncertainty is not expected to affect this estimate of cost savings to a great extent.

- The cost estimates for landfill management are overstated, particularly for smaller generators, because other forms of hazardous waste (e.g., spent F007 and F008 wastes) are generated in electroplating operations. These wastes may be shipped with the F006 wastewater treatment sludge to the landfill in the same truck if the wastes are compatible, resulting in lower per-unit transportation costs due to a generator's ability to take advantage of economies of scale and avoid incurring the minimum landfill charge on multiple loads. To the extent that generators are able to avoid these charges, this estimate would overstate cost savings.

- Recycling costs are overstated, particularly for small generators, because transporters may stop at two or more electroplating facilities creating fuller loads, thereby reducing per-unit transportation costs. Economies of scale may be achieved that exceed the minimum recycling charge. If affected generators are able to avoid a minimum recycling charge in the baseline, this would result in the cost savings estimated in this analysis being overstated.

- Increased costs to the generator associated with storing F006 waste for a greater length of time were not considered in this analysis (e.g., costs of additional containers and storage space). These costs would offset cost savings resulting from longer accumulation periods.

- Finally, there may exist instances where LQGs segregate their F006 streams to improve the quality of the sludge (i.e., segregate sludges by particular type of metal content) for recycling and allowing them to accumulate more economic quantities for recycling. Also, some LQGs will have more flexibility to accumulate the waste for up to 270 days in most cases to try to gain a better price. This study does not address these possible benefits. If affected generators are able to obtain a better price through longer accumulation periods, the cost savings estimated in this analysis would understate true cost savings.

- Today's final rule includes a requirement that metal finishers who wish to accumulate F006 on site for 180 days must conduct pollution prevention activities. Examples of pollution prevention activities that meet this requirement include drag out control, counter-current rinse arrangement, or chemical substitution (e.g., use of non-cyanide baths). Although there are start up costs associated with the use of some of these techniques, they are already commonly used within the metal finishing industry.[13] Accordingly, EPA does not believe that there are incremental costs associated with the pollution prevention requirement in today's rule.

- As mentioned in the preceding Section, the actual number of metal finishing operations is believed to be much greater than those reporting to the Biennial Reporting System and modeled in this analysis. This disparity is due in part because: 1) some metal finishing firms generate an electroplating sludge that is not F006 (either because it has been delisted, excluded through a recycling variance or is generated from one of the six processes outside of the listing description), 2) some metal finishers may be small quantity generators and thus not report to the Biennial Reporting System (these firms would be unaffected by this rulemaking), and 3) some firms may be nonnotifiers. Because the actual number of potentially affected firms may greater than what is estimated in this analysis, the cost savings estimated would understate the actual cost savings.

2.4 Organization of Report

The remainder of this report is divided into six sections. Section 3 presents an economic profile of the electroplating industry. For this industry, available economic profile data are presented including products manufactured, profile of facilities, market structure, and an assessment of the market value of industry shipments.

Section 4 presents estimated of the quantity of F006 hazardous waste affected by this change in the accumulation time limit and estimated of current and alternative compliance costs associated with hazardous waste storage, transportation, and off-site management practices. Unit costs and prices for the current and alternative compliance cost estimates are presented in this chapter as well as a summary of associated regulatory costs. Section 5 documents the economic impacts of the two regulatory options. Section 6 summarizes potential qualitative benefits associated with the regulation. Section 7 discusses other issues related to the regulation. Section 8 presents conclusions on the regulatory impacts of the final rule.

3.0 INDUSTRY PROFILE

3.1 Overview of Products and Processes

Electroplating includes a wide range of production processes, including common and precious metal electroplating, anodizing, chemical conversion coating, electroless plating, chemical etching and milling, and printed circuit board manufacturing. Electroplating is the application of

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[13] For example, one industry survey conducted in 1994 indicated that almost 70 percent of 318 survey respondents had counter-current rinse controls in place and the over 80 percent used some type of drag out control returning plating chemical to the bath rather than to the rinse tank. George Cushnie, CAI Engineering National Center for Manufacturing Sciences/National Association of Metal Finishers. NCMS/NAMF, Pollution Prevention and Control Technology for Plating Operations, 1994, pp. 39, 49.

a metal surface coating which will increase wear or erosion resistance, or simply provide decoration. The piece to be coated is immersed in a plating bath or solution. Typically, a plating line is composed of a series of plating units applying a sequence of coatings.[14] Metals employed in electroplating operations include chromium, copper, nickel, zinc, gold and silver. Cyanides also are frequently found in plating, stripping and cleaning solutions.[15]

In 1980, the U.S. EPA listed wastewater treatment sludges from electroplating operations as hazardous waste and assigned the material the waste code F006. F006 waste was listed for the hazardous constituents cadmium, hexavalent chromium, nickel, and complexed cyanides. It also may contain lead, arsenic, and organics. The listing excludes wastewater treatment sludges generated from the following processes: 1) sulfuric acid anodizing of aluminum, 2) tin plating on carbon steel, 3) zinc plating (segregated basis) on carbon steel, 4) aluminum or zinc-aluminum plating on carbon steel, 5) cleaning/stripping associated with tin, zinc or aluminum on carbon steel, and 6) chemical etching and milling of aluminum. The listing extends to any material removed from an electroplating wastewater treatment system other than the treated effluent.

The composition of F006 sludge is dependent on the reagent or technology used to treat plating rinse waters, the configuration of plating lines with rinse tanks and the number of treatment tanks, the electrolyte in the plating bath (acid and alkaline or cyanide and noncyanide), and process controls on the plating line. Metals are typically precipitated with a hydroxide (lime) reagent to form a metal hydroxide sludge. Sulfide precipitation may follow the lime precipitation as a polishing step which typically generates only small quantities of metal precipitates. Therefore, other reagents used include sulfides and phosphates. Ion exchange technologies produce wastes having a different physical form than chemical precipitation technologies. Also, rinsewaters are typically co-mingled from several different plating lines resulting in many different metals being present in the F006 sludge. Therefore, segregation of rinse waters increases the metal recovery efficiency. Sludges containing one or two metals (e.g., copper, nickel, zinc, or chromium) are more marketable than those containing three or more. Waste composition data from 1981 to 1984 identify the presence of recyclable metals in F006 to be in the following concentration ranges: chromium (0.002 - 4%), copper (<0.006 - 1.5%), nickel (<0.006 - 1.5%), and zinc (0.003 - 3.3%).[16, 17]

Sampling data collected by EPA for this rulemaking indicate that approximately ten percent of electroplaters generate F006 sludge that is not amenable to metals recovery because the sludge contains too high a concentration of cadmium. Cadmium is an impurity that is undesirable for smelters. Therefore, it is assumed that approximately 90 percent of the electroplaters generate a

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[14] Environ Corporation, Characterization of Waste Streams Listed in 40 CFR Section 261: Waste Profiles, Volume I, prepared for the U.S. EPA, Waste Identification Branch, undated.

[15] Ibid.

[16] Ibid.

[17] Borst, Paul A., pp. 174.

sludge that can be recycled without technical limitations with regard to its composition and use as feedstock material.

Certain plating wastes are more marketable than others. Copper-only and nickel-only F006 sludges have the highest value. Bi-metal copper and nickel sludge (with limited chromium and lead), bi-metal nickel and chromium sludge (with limited copper), and bi-metal zinc and copper sludge (with limited chromium and nickel) also have good marketability due to the fact that these metals are relatively amenable to metals recovery. These sludges are more marketable than chromium-only and poly-metal nickel/chromium/copper F006 sludges.[18]

3.2 Profile of Affected Facilities

Tables 3-1 and 3-2 provide a profile of the facilities under Option 1 and Option 2 that are most likely to be affected by an 180/270 day accumulation period for F006 waste. This table uses data from the 1995 Biennial Report on F006 sludge generation.

Table 3-1. Profile of Affected Facilities (OPTION 1)*

Quantity Interval (Tons/Year)	Number of Generators	Percent of Total Waste	Cumulative Percent of Waste
0 - 13.2	638	11%	11%
13.2 - 23.2	260	16%	27%
23.2 - 33.2	160	15%	42%
33.2 - 43.2	116	15%	57%
43.2 - 53.2	96	16%	73%
53.2 - 63.2	78	16%	89%
63.2 - 70.8	47	11%	100%
Total	1395	100%	

* Option 1 allows accumulation of up to 17.7 tons of F006.

Table 3-2. Profile of Affected Facilities (OPTION 2)*

Quantity Interval (Tons/Year)	Number of Generators	Percent of Total Waste	Cumulative Percent of Waste
0 - 13.2	638	9%	9%

[18] Borst, Paul A., pp. 174, and DPRA confidential communication.

Table 3-2. Profile of Affected Facilities (OPTION 2)*			
Quantity Interval (Tons/Year)	**Number of Generators**	**Percent of Total Waste**	**Cumulative Percent of Waste**
13.2 - 23.2	260	13%	22%
23.2 - 33.2	160	12%	33%
33.2 - 43.2	116	12%	45%
43.2 - 53.2	96	13%	58%
53.2 - 63.2	78	13%	71%
63.2 - 73.2	62	12%	83%
73.2 - 88	73	16%	100%
Total	1,483	72%	

* Option 2 allows accumulation of up to 22 tons of F006.

3.3 Market Structure

The metal finishing industry can be divided into two major segments, job shops and captive shops. Job shops tend to be small independently owned metal finishing companies that employ 15 to 20 people and generate $800,000 to $1 million in annual gross revenues. Typically, captive shops conduct metal finishing operations as part of a larger manufacturing operation. It is estimated that within the U.S. there are three times as many captive shops as there are job shops.[19]

In 1992, according to the U.S. Department of Commerce, Census of Manufacturers, there were approximately 3,296 plating and polishing facilities in the U.S. California had the largest number of facilities with 17 percent of the total. Illinois, Ohio, and Michigan also reported large numbers of plating and polishing facilities with 8.5, 8.3, and 7.6 percent respectively.[20]

As of 1995, the plating and polishing industry employed 75,900 people. Table 3-2 indicates the total number of people employed by the industry from 1992 through 1995. Table 3-3 provides 1992 employment statistics by facility size. As shown in Table 3-3, 71 percent of all electroplating facilities employ less then 20 employees.

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[19] U.S. EPA, Office of Enforcement Compliance Assurance, "EPA Office of Compliance Sector Notebook Project Profile of the Fabricated Metal Products Industry," pp. 5,8.

[20] U.S. Department of Commerce, 1992 Census of Manufacturers.

Table 3-2. Total Number of Employees				
	1992	**1993**	**1994**	**1995**
Total Number of Employees	65,400	67,300	70,600	75,900

Source: U.S. Department of Commerce, 1992 Census of Manufacturers

Table 3-3. Employment Statistics by Facility Size		
Size of Establishment	**Number of Establishments**	**Percent of Total**
1 to 4 employees	962	29%
5 to 9 employees	668	20%
10 to 19 employees	716	22%
20 to 49 employees	650	20%
50 to 99 employees	219	7%
100 to 249 employees	71	2%
250 to 499 employees	8	0%
500 to 999 employees	2	0%
Total	3,296	100%

Source: U.S. Department of Commerce, 1992 Census of Manufacturers

3.4 SIC 3471 Industry Shipments

The market value of industry shipments for the plating and polishing industry, increased by approximately 22 percent from 1992 to 1995 from over $4.7 billion to nearly $5.8 billion. This represents an annual growth rate of seven percent, which exceeds the overall growth rate for the economy as a whole. Table 3-4 provides data on 1992 shipments by facility size.

Table 3-4. Value of 1992 Shipments by Facility Size

Size of Establishment	Number of Establishments	Value of Shipments (millions)	Percent of Total Value
1 to 4 employees	962	127.2	3%
5 to 9 employees	668	279.8	6%
10 to 19 employees	716	590.9	13%
20 to 49 employees	650	1,319.3	28%
50 to 99 employees	219	1,126.0	24%
100 to 249 employees	71	958.9	20%
250 to 499 employees	8	323.5	7%
500 to 999 employees	2	NA	NA
Total	3,296	4,725.6	100%

Source: U.S. Department of Commerce, 1992 Census of Manufacturers

4.0 COST IMPACT ANALYSIS

4.1 F006 Hazardous Waste Generation

Annual hazardous waste generations and management data for F006 sludge were reported on a facility-specific level in EPA's 1995 Biennial Reporting System (BRS). In 1995, 1,934 facilities reported generating F006 sludge.[21] Tables 4-1 and 4-2 present the hazardous waste generation statistics for F006 sludge generation, as reported in the BRS database, for Option 1 and Option 2.

The affected population under waste accumulation Option 1 (limiting F006 accumulation to 17.7 tons), those electroplating facilities that are LQGs, but generated less than 17.7 tons of F006 in a 90-day period, accounts for approximately 12.5 percent of the total reported amount of F006 waste generated in 1995 according to BRS data. For the affected population, the average generation rate is approximately 20.8 tons per year and the median generation rate is approximately 15.3 tons per year.

Table 4-1. F006 Hazardous Waste Generation Statistics (OPTION 1)

F006 Generator Characteristics	Total Population of F006 LQGs	Population of Affected F006 LQGs (< 70.8 tons/yr)
No. of Large Quantity Generators	1,934	1,395 (72%)
Total Quantity (tons/year)	232,636	29,075 (12%)
Maximum Generation Quantity (tons/year)	25,981	70.8
90th Percentile Generation Quantity (tons/year)	214	51.8
Average Generation Quantity (tons/year)	120	20.8
Median Generation Quantity (tons/year)	27	15.3
10th Percentile Generation Quantity (tons/year)	2	1.3
Minimum Generation Quantity (tons/year)	0.003	0.003

Source: U.S. EPA, 1995 Biennial Reporting System

[21] This number underestimates the total number of facilities generating F006, since SQGs are not required to complete a Biennial Report. In addition, as mentioned above in Section 2.2, the BRS data underestimates the total number of facilities generating F006 waste.

The affected population under waste accumulation Option 2 (limiting F006 accumulation to 22 tons), those electroplating facilities that are LQGs, but generated less than 22 tons of F006 in a 90-day period, accounts for approximately 15.4 percent of the total reported amount of F006 waste generated in 1995 according to BRS data. For the affected population, the average generation rate is approximately 24.3 tons per year and the median generation rate is approximately 16.8 tons per year.

Table 4-2. F006 Hazardous Waste Generation Statistics (OPTION 2)

F006 Generator Characteristics	Total Population of F006 LQGs	Population of Affected F006 LQGs (< 88 tons/yr)
No. of Large Quantity Generators	1,934	1,483 (77%)
Total Quantity (tons/year)	232,636	35,976 (15.4%)
Maximum Generation Quantity (tons/year)	25,981	87.3
90th Percentile Generation Quantity (tons/year)	214	60.8
Average Generation Quantity (tons/year)	120	24.3
Median Generation Quantity (tons/year)	27	16.8
10th Percentile Generation Quantity (tons/year)	2	1.4
Minimum Generation Quantity (tons/year)	0.003	0.003

Source: U.S. EPA, 1995 Biennial Reporting System

4.2 Current Waste Storage, Transportation, and Management Practices and Costs

Recycling Costs

Recycling costs for recovering metals from F006 wastewater treatment sludges are estimated from 1993 cost data provided in Exhibit 7-1 of Cushnie, George C., CAI Engineering, "Pollution Prevention and Control Technology for Plating Operations," prepared for NCMS/NAMF. Table 4-2 presents an estimate of the metal recycling/recovery unit costs being paid by F006 sludge generators. Transportation costs were subtracted from the estimated recycling costs. 1997 unit transportation prices reported in Environmental Cost Handling Options and Solutions (ECHOS), Environmental Remediation Cost Data-Unit Price, 4th Annual Edition, published by R.S. Means and Delta Technologies Group, Inc., 1998, were used to estimate transportation costs.

ECHOS lists the minimum 1997 charge for a bulk shipment of hazardous waste (not requiring stabilization) at $1,350 for commercial landfill disposal. For this analysis, this value serves as a proxy for the minimum recycling charge for commercial metal recycling/recovery.[22] The value is a good proxy because while the stabilized landfill price is, in theory, the highest minimum recycling charge, the unstabilized price reflects the practice of recyclers providing some credit to the generators for a percentage of the market value received for base metals and precious metals recovered from the sludge against the processing fee that generators pay the recyclers. Differences in average unit recycling costs are the result of variability in the amount various recyclers charge generators. A major factor contributing to the differences in recycling costs is metal content (i.e., concentration and type of metals present in the waste). The generally lower costs for the small facilities may be due to the fact that these facilities tend to generate single-metal wastes which are more amenable to recycling.

An average unit recycling cost of $0.20/lb is assumed as an upper-end typical price charged by a metals recovery facility based on the 1993 data provided in Cushnie. One recycler that was contacted provided an average 1998 price of approximately $0.10/lb. For this analysis, impacts are evaluated based on average recycling prices ranging from $0.10/lb to $0.20/lb with a minimum recycling charge of $1,350 per shipment.[23] In some cases, when the metal value is very high, the charges can be somewhat lower.[24] Minimum charges are at least sometimes avoided when the recycler actually picks up the F006 directly from the generator.[25]

Landfill Costs

ECHOS list the following 1997 commercial landfill disposal prices: 1) minimum charge for bulk shipments is $1,350, 2) with stabilization the minimum charge is $2,267, 3) landfill of hazardous solid bulk waste is $141.67/ton ($0.07/lb), 4) with stabilization the price is $241.33/ton ($0.12/lb), and 5) landfill of jumbo bags requiring stabilization is $335/each ($0.17/lb, assuming one ton per supersack).

For this analysis, the ECHOS data provides the best approximation of the landfill prices currently being charged to small LQGs that may or may not have a full shipment of waste. Because of the presence of hazardous metals, prices including stabilization are used to reflect current pre-treatment requirements under Land Disposal Restriction (LDR) regulations. A unit price of

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[22] This assumption was confirmed by industry contacts who accepted partial loads, or small lots (Sippel, 1999, Personal Communication, Noranda, Ontario, Canada; Shield, 1999, Personal Communication, American Nickeloid, Illinois). Other contacts indicated that the minimum charge concept was appropriate, but their companies did not deal in small lots as a matter of practice due to the inconvenience (Walker, 1999, Personal Communication, Inco Limited, Toronto, Ontario; LeCompte, 1999, Personal Communication, Cyprus Miami, Arizona).

[23] The estimates of average recycling costs were confirmed by industry contacts (Jarvis, 1999, Personal Communication, Eritech, North Carolina; Anonymous, 1999, Personal Communication, Sun-Glo Pating, Florida).

[24] Shields, 1999, Personal Communication, American Nickeloid, Illinois.

[25] Jarvis, 1999, Personal Communication, Eritech, North Carolina; and Anonymous, 1999, Personal Communication, Dearborn Brass, Texas.

$335/supersack ($335/ton) is assumed with a minimum shipment charge of $2,300.

Transportation Costs

Tables 4-3 and 4-4 present the estimated transport unit costs paid by F006 sludge generators based on quarterly generation rates and assuming partial load shipments. Appendix A presents the estimated transport unit costs paid by F006 sludge generators based on quarterly generation rates and assuming a transporter collects sludge from multiple generators to complete a full load (using 15 tons per load as an example). Appendix B presents the calibration of the transportation cost model used in the analysis to 1997 unit transportation prices reported in ECHOS.

Table 4-2. Estimated F006 Recycling Costs (1993$)					
Generator Type	**No. of Data Points**	**Transport**		**Recycling**	
		Average Unit Cost ($/lb) (+/- st. dev.)	**Minimum Median Maximum Unit Cost ($/lb)**	**Average Unit Cost ($/lb) (+/- st. dev.)**	**Minimum Median Maximum Unit Cost ($/lb)**
Small LQG - small shipment (< 13.2 t/yr)*	31	0.49 +/-0.50	0.11 0.27 2.07	0.02 +/-0.56	-1.77 0.07 0.76
Small LQG - large shipment (13.2 - < 60 t/yr)	36	0.11 +/-0.08	0.02 0.08 0.39	0.20 +/-0.21	-0.14 0.18 1.04
Large LQG (60 t/yr or greater)	20	0.06 +/-0.05	0.02 0.02 0.16	0.17 +/-0.15	0.01 0.14 0.61
Total	87	0.15 +/-0.18	0.02 0.09 1.04	0.22 +/-0.27	-0.74 0.18 0.90

* Assumes all facilities are LQGs and ship four times per year. This data may include SQGs which ship at a maximum of 2 times per year. If these facilities are SQGs, the average transport unit cost is $0.25/lb (+/-0.25) and average recycling unit cost is $0.26/lb (+/-0.36).

Assumptions:

Step 1: Used 1993 cost data provided in Exhibit 7-1 of Cushnie, George C., CAI Engineering, "Pollution Prevention and Control Technology for Plating Operations," prepared for NCMS/NAMF.

Step 2: Eliminated seven data records from Cushnie that do not provide either shipping distance, quantity shipped, or unit cost. Based on inspection, four records eliminated as statistical outliers because they were greater than 3 standard deviations from mean cost .

Step 3: Assumed the following distances:

Category < 500 miles = 250 miles,
Category 500 to 1,000 miles = 750 miles,
Category 1,000 to 1,500 miles = 1,250 miles,
Category 1,500 to 2,000 miles = 1,750 miles, and
Category 2,000 to 2,500 miles = 2,250 miles.

Step 4: Assumed LQG and 90-day storage if > 26,400 lbs generated annually.

Step 5: Assumed a full shipment size of 15 tons based upon EPA's Common Sense Initiative report.

Step 6. Assumed minimum of 4 shipments/year (i.e., 90-day storage limit) for LQGs.

Step 7: Used 1998 ECHOS transportation unit price estimates ($/mile) for van trailer transportation of hazardous waste. Assume transportation prices have not changed significantly since 1993 given that increased labor costs are likely being balanced by historically low fuel costs.

Step 8. Used 1998 ECHOS minimum charge for van trailer transportation of small hazardous waste loads of $732.33 per shipment as a minimum cost. Assumed $2.64/each supersack for loading on to the truck. Assumed transportation prices have not changed significantly since 1993 given that increased labor costs are likely being balanced by historically low fuel costs.

Table 4-3. TRANSPORTATION COSTS (OPTION 1) (Partial Load Shipments -- No Multiple Stops)								
Annual Generation Rate (tons)	Shipment Data		Annual Loading/ Unloading Costs		Annual Transportation Costs ($/year)***			
	Load Size (%)	Load Frequency (loads/yr)	Loading/ Unloading Unit Cost ($/load)*	Annual Loading Costs ($/year)**	100, 200, and 300 miles/load ($694/load min.)	400 miles/load ($2.08/mi)	600 miles/load ($2.08/mi)	1,000 miles/load ($1.97/mi)
90-day Accumulation Time Limit: Applicable for Baseline Recycling and Landfill Costs and Post-Regulatory Landfill Costs								
5	7	4	$50	$200	$2,776	$3,328	$4,992	$7,880
10	14	4	$60	$240	$2,776	$3,328	$4,992	$7,880
20	28	4	$80	$320	$2,776	$3,328	$4,992	$7,880
30	42	4	$100	$400	$2,776	$3,328	$4,992	$7,880
40	57	4	$120	$480	$2,776	$3,328	$4,992	$7,880
50	71	4	$140	$560	$2,776	$3,328	$4,992	$7,880
60	85	4	$160	$640	$2,776	$3,328	$4,992	$7,880
70	99	4	$180	$720	$2,776	$3,328	$4,992	$7,880
180-day Accumulation Time Limit: **Applicable for post-regulatory recycling costs for the following generators:** **generators < 23.5 tons/year and shipping to a recycling facility < 200 miles away AND** **generators > 23.5 tons/year and shipping to a recycling facility at any distance +**								
5	14	2	$60	$120	$1,388	NA	NA	NA
10	28	2	$80	$160	$1,388	NA	NA	NA
20	57	2	$120	$240	$1,388	NA	NA	NA
30	85	2	$160	$320	$1,388	$1,664	$2,496	$3,940
40	100	2.26	$180	$410	$1,568	$1,880	$2,820	$4,452
50	100	2.82	$180	$510	$1,960	$2,350	$3,525	$5,565
60	100	3.39	$180	$620	$2,353	$2,820	$4,231	$6,678
70	100	3.95	$180	$720	$2,745	$3,290	$4,931	$7,791

Table 4-3. TRANSPORTATION COSTS (OPTION 1) (Partial Load Shipments -- No Multiple Stops)								
Annual Generation Rate (tons)	**Shipment Data**		**Annual Loading/ Unloading Costs**		**Annual Transportation Costs ($/year)*****			
	Load Size (%)	**Load Frequency (loads/yr)**	**Loading/ Unloading Unit Cost ($/load)***	**Annual Loading Costs ($/year)****	**100, 200, and 300 miles/load ($694/load min.)**	**400 miles/load ($2.08/mi)**	**600 miles/load ($2.08/mi)**	**1,000 miles/load ($1.97/mi)**
270-day Accumulation Time Limit: **Applicable for post-regulatory recycling costs for the following generators:** **generators < 23.5 tons/year and shipping to a recycling facility > 200 miles away ++**								
5	21	1.33	$70	$93	$925	$1,109	$1,664	$2,627
10	42	1.33	$100	$133	$925	$1,109	$1,664	$2,627
20	85	1.33	$160	$213	$925	$1,109	$1,664	$2,627

* Assumed $40/hour for truck driver (fully loaded), 0.5 administrative trucker hour per stop, 0.1 hours to load/unload a single one ton super sack resting on a pallet, 1.0 hour transport added time for each extra stop, and 0.5 administrative electroplater hour per stop. Assume that electroplaters currently have accumulation storage area capacity to contain a full 15 ton load. Loading/Unloading Unit Cost = $40/hr * [0.5 hr admin trucker + 0.5 hr admin electroplater + (0.1 hr loading per ton + 0.1 hr unloading per ton) * (17.7 ton/load) * (load size/100)]

** Annual Loading Costs = Load Frequency * Loading/Unloading Unit Cost

*** Annual Transportation Costs (>300 miles) = Load Frequency * Miles/Load * $/mile
Annual Transportation Costs (< 300 miles) = Load Frequency * Minimum Charge of $694/Load

\+ Generators generating more than 23.46 tons/year will accumulate waste too quickly to be able to accumulate wastes up to 270 days.

++ Generators are allowed to accumulate up to 16,000 kg (23.5 tons/year) of F006 waste on site in a 270 day time limit if shipped more than 200 miles to a metals recovery facility.

Baseline Recycling Transportation Cost =	90-day Accumulation Annual Loading/Unloading Cost + 90-day Accumulation Annual Transportation Cost
Baseline and Post-Reg. Landfill Transportation Cost =	90-day Accumulation Annual Loading/Unloading Cost + 90-day Accumulation Annual Transportation Cost
Post-Regulatory Recycling Transportation Cost =	180-day or 270-day Accumulation Annual Loading/Unloading Cost + 180-day or 270-day Accumulation Annual Transportation Cost
Incremental Landfill Transportation Cost Savings =	$0
Incremental Recycling Transportation Cost Savings =	Post-Regulatory Recycling Transportation Cost - Baseline Recycling Transportation Cost

Table 4-4. TRANSPORTATION COSTS (OPTION 2) (Partial Load Shipments -- No Multiple Stops)								
Annual Generation Rate (tons)	Shipment Data		Annual Loading/ Unloading Costs		Annual Transportation Costs ($/year)***			
	Load Size (%)	Load Frequency (loads/yr)	Loading/ Unloading Unit Cost ($/load)*	Annual Loading Costs ($/year)**	100, 200, and 300 miles/load ($694/load min.)	400 miles/load ($2.08/mi)	600 miles/load ($2.08/mi)	1,000 miles/load ($1.97/mi)
90-day Accumulation Time Limit: Applicable for Baseline Recycling and Landfill Costs and Post-Regulatory Landfill Costs								
5	6	4	$50	$200	$2,776	$3,328	$4,992	$7,880
10	11	4	$60	$240	$2,776	$3,328	$4,992	$7,880
20	23	4	$80	$320	$2,776	$3,328	$4,992	$7,880
30	34	4	$100	$400	$2,776	$3,328	$4,992	$7,880
40	45	4	$120	$480	$2,776	$3,328	$4,992	$7,880
50	57	4	$140	$560	$2,776	$3,328	$4,992	$7,880
60	68	4	$160	$640	$2,776	$3,328	$4,992	$7,880
70	80	4	$180	$720	$2,776	$3,328	$4,992	$7,880
80	91	4	$200	$800	$2,776	$3,328	$4,992	$7,880
180-day Accumulation Time Limit: **Applicable for post-regulatory recycling costs for the following generators: generators < 29.3 tons/year and shipping to a recycling facility < 200 miles away AND generators > 29.3 tons/year and shipping to a recycling facility at any distance +**								
5	11	2	$60	$120	$1,388	NA	NA	NA
10	23	2	$80	$160	$1,388	NA	NA	NA
20	45	2	$120	$240	$1,388	NA	NA	NA
30	68	2	$160	$320	$1,388	$1,664	$2,496	$3,940
40	91	2	$200	$400	$1,388	$1,664	$2,496	$3,940
50	100	2.27	$220	$490	$1,577	$1,891	$2,836	$4,477
60	100	2.73	$220	$590	$1,893	$2,269	$3,404	$5,373
70	100	3.18	$220	$690	$2,208	$2,647	$3,971	$6,268
80	100	3.64	$220	$790	$2,524	$3,025	$4,538	$7,164

Table 4-4. TRANSPORTATION COSTS (OPTION 2) (Partial Load Shipments -- No Multiple Stops)								
Annual Generation Rate (tons)	**Shipment Data**		**Annual Loading/ Unloading Costs**		**Annual Transportation Costs ($/year)*** **			
	Load Size (%)	**Load Frequency (loads/yr)**	**Loading/ Unloading Unit Cost ($/load)***	**Annual Loading Costs ($/year)****	**100, 200, and 300 miles/load ($694/load min.)**	**400 miles/load ($2.08/mi)**	**600 miles/load ($2.08/mi)**	**1,000 miles/load ($1.97/mi)**
270-day Accumulation Time Limit: **Applicable for post-regulatory recycling costs for the following generators: generators < 29.3 tons/year and shipping to a recycling facility > 200 miles away ++**								
5	17	1.33	$70	$93	$925	$1,109	$1,664	$2,627
10	34	1.33	$100	$133	$925	$1,109	$1,664	$2,627
20	68	1.33	$160	$213	$925	$1,109	$1,664	$2,627

* Assumed $40/hour for truck driver (fully loaded), 0.5 administrative trucker hour per stop, 0.1 hours to load/unload a single one ton super sack resting on a pallet, 1.0 hour transport added time for each extra stop, and 0.5 administrative electroplater hour per stop. Assume that electroplaters currently have accumulation storage area capacity to contain a full 15 ton load. Loading/Unloading Unit Cost = $40/hr * [0.5 hr admin trucker + 0.5 hr admin electroplater + (0.1 hr loading per ton + 0.1 hr unloading per ton) * (22 ton/load) * (load size/100)]

** Annual Loading Costs = Load Frequency * Loading/Unloading Unit Cost

*** Annual Transportation Costs (>300 miles) = Load Frequency * Miles/Load * $/mile
Annual Transportation Costs (< 300 miles) = Load Frequency * Minimum Charge of $694/Load

\+ Generators generating more than 29.3 tons/year will accumulate waste too quickly to be able to accumulate wastes up to 270 days.

++ Generators are allowed to accumulate up to 20,000 kg (29.3 tons/year) of F006 waste on site in a 270 day time limit if shipped more than 200 miles to a metals recovery facility.

Baseline Recycling Transportation Cost =	90-day Accumulation Annual Loading/Unloading Cost + 90-day Accumulation Annual Transportation Cost
Baseline and Post-Reg. Landfill Transportation Cost =	90-day Accumulation Annual Loading/Unloading Cost + 90-day Accumulation Annual Transportation Cost
Post-Regulatory Recycling Transportation Cost =	180-day or 270-day Accumulation Annual Loading/Unloading Cost + 180-day or 270-day Accumulation Annual Transportation Cost
Incremental Landfill Transportation Cost Savings =	$0
Incremental Recycling Transportation Cost Savings =	Post-Regulatory Recycling Transportation Cost - Baseline Recycling Transportation Cost

5.0 ECONOMIC IMPACT ANALYSIS

5.1 Methodology

To gain a better understanding of the final rule's impacts multiple cases were examined. Under waste accumulation Option 1 (limiting F006 accumulation to 17.7 tons), eight cases were considered consisting of 5, 10, 20, 30, 40, 50, 60, and 70 ton/year generators of F006. The costs to recycle pre- and post-regulation were compared with the costs to dispose the F006 waste in a Subtitle C Landfill. Under Option 2 nine cases were considered consisting of 5, 10, 20, 30, 40, 50, 60, 70 and 80 ton/year generators of F006.

Derived recycling cost data from a 1993 study by George C. Cushnie[26] indicates an average recycling cost for F006 sludge of approximately $400 per ton. Additional recycling cost estimates obtained from one recycling facility indicated a cost range of $100 to $400 per ton and an average cost of approximately $225 per ton; unfortunately the information obtained from one recycler may not be representative of the entire industry. Recycling costs are examined using a recycling fee of $300/ton. A minimum recycling charge of $1,350 is assumed as the economic breakpoint where the metals recovery facility is willing to accept and process the shipment of F006 sludge. The recycling fee is determined by the recycling facility, depending on the metal content of the sludge, and will vary widely; in some cases the recycler will pay for the sludge when the metal contents are high and the sludge contains a limited number of metals, making it easier to recover the individual metals.

Transportation costs (1997$) are estimated from the data shown in Tables 4-3 and 4-4. For this analysis, recycling costs are estimated for facilities located at distances of 300, 600, and 1000 miles from a generator. Analysis of BRS data indicates that the average distance between an F006 generator and a metals recovery facility is approximately 600 miles. A minimum transport charge of $694 is assumed as the economic breakpoint where the transporter is willing to ship the F006 sludge to a metals recovery facility or landfill. Waste management data from the BRS are used to estimate the distances that F006 sludge has been transported for recycling; it is important to recognize that generators do not necessarily limit management of their wastes to the nearest recycling facility. In short, recyclers frequently specialize in recycling certain types of sludge (and metals); consequently generators may have to ship their wastes to facilities other than the closest facilities.

ECHOS data (1997$) are used in developing the cost to landfill. For this analysis, a unit price of $335/ton is assumed. A minimum landfill charge of $2,300 is assumed reflecting the economic breakpoint where the landfill operator is willing to accept and pre-treat (i.e., solidify) the shipment of F006 sludge. A minimum transport charge of $694 is assumed reflecting the economic breakpoint where the transporter is willing to ship the F006 sludge to the landfill

[26] Cushnie, George C., CAI Engineering, "Pollution Prevention and Control Technology for Plating Operations," prepared for NCMS/NAMF.

operator. Transportation costs are developed from the data shown in Tables 4-3 and 4-4 for landfills at a distance of 100, 200, and 400 miles from a generator. As with the recycling transportation distances, this range of distances was selected based on the BRS data indicating generator and recycling facility locations.[27] Average distance from generator to landfill based on analyses of the BRS data was approximately 200 miles.

The number of generators which will shift to recycling, was estimated by comparing the costs of recycling versus land disposal. As noted in the previous sections, a number of variables affect these costs, including travel distance to the respective recycling/disposal facilities and the value of the waste for recycling. In accommodating the different travel distances the approximate milage between generators and landfills, and generators and recyclers were estimated based on an analysis of a 1995 BRS data. The results of this assessment are:

Generator to Recycler Distances (Miles)	**Percent of Observations**	**Distance Used in Cost Estimate**
0-200	20	200
201-450	16	300
451-800	31	600
801+	33	1,000
Generator to Landfill Distances (Miles)	**Percent of Observations**	**Distance Used in Cost Estimate**
0-150	42	100
151-300	29	200
301+	29	400

5.2 Option 1 Findings

Impacts associated with Option 1, which allows the accumulation of F006 for 180 days (270 days in certain circumstances), up to a total quantity of 17.7 tons is presented in this section.

5.2.1 Estimated Cost Impacts and Increases in Recycling

Estimated costs for each of the facility sizes are presented in Tables 5-1 and 5-2. Costs presented include land disposal cost and recycling costs under baseline and post regulatory conditions. Cost impacts associated with the 180/270 day accumulation period to F006 generators were

[27] Distances were calculated based on BRS data where generators indicated recyclers' locations. Recyclers included metal smelters as well as other processors (who ultimately send the F006 to smelters).

estimated by examining potential decreases in recycling costs for the generators affected by the rulemaking. For example, the recycling costs for an electroplater generating five tons of F006 waste per year shipping to a metals recycling facility located 300 miles away are estimated to decrease by approximately $5,557 per year (1997$)[28] as a result of the 180/270 day accumulation time limit. Considering all facilities in this size category, which generate between 2.5 to 7.5 tons of F006 per year, the aggregate cost savings were estimated. Cost savings were estimated for all of the generator configurations developed to approximate the cost savings associated with the regulation. Not all generators will be affected by the final rule; consequently some adjustments were made to approximate the number of generators that would benefit from the 180/270 day accumulation period and therefore increase the quantity of F006 that is recycled, as described below. According to the BRS data, the 1995 recycling rate for the affected 1,395 generators of F006 (i.e., generators that generate less than 17.7 tons of F006 within a 90-day period) is approximately 40 percent. All of the affected generators that currently recycle will benefit from the regulation. The remaining affected generators, those generators that currently do not recycle, will only benefit to the extent they switch from landfilling to recycling.

28 Calculated using values from Table 5-1: $8,376 baseline annual recycling cost - $2,819 post-regulatory annual recycling cost = $5,557 annual recycling cost savings.

Table 5-1. Generator Incremental Savings: Post-Regulatory vs. Baseline Recycling Costs (Option 1)				
Generator Size (tons/year)	**Distance to Recycler (miles)**	**Baseline Recycling Costs 1/**	**Post-Regulatory Recycling Costs 1/**	**Incremental Savings**
5	<200	$8,376	$4,208	$4,168
	300	$8,376	$2,819	$5,557
	600	$10,592	$3,557	$7,035
	1,000	$13,480	$4,520	$8,960
10	<200	$8,416	$4,548	$3,868
	300	$8,416	$4,059	$4,357
	600	$10,632	$4,797	$5,835
	1,000	$13,520	$5,760	$7,760
20	<200	$9,096	$7,628	$1,468
	300	$9,096	$7,139	$1,957
	600	$11,312	$7,877	$3,435
	1,000	$14,200	$8,840	$5,360
30	<200	$12,176	$10,708	$1,468
	300	$12,176	$10,484	$1,692
	600	$14,392	$11,423	$2,969
	1,000	$17,280	$12,647	$4,633
40	<200	$15,256	$13,979	$1,277
	300	$15,256	$13,979	$1,277

Table 5-1. Generator Incremental Savings: Post-Regulatory vs. Baseline Recycling Costs (Option 1)				
Generator Size (tons/year)	**Distance to Recycler (miles)**	**Baseline Recycling Costs 1/**	**Post-Regulatory Recycling Costs 1/**	**Incremental Savings**
	600	$17,472	$15,231	$2,241
	1,000	$20,360	$16,862	$3,498
50	<200	$18,336	$17,473	$863
	300	$18,336	$17,473	$863
	600	$20,552	$19,038	$1,514
	1,000	$23,440	$21,078	$2,362
60	<200	$21,416	$20,968	$448
	300	$21,416	$20,968	$448
	600	$23,632	$22,846	$786
	1,000	$26,520	$25,294	$1,226
70	<200	$24,496	$24,463	$33
	300	$24,496	$24,463	$33
	600	$26,712	$26,654	$58
	1,000	$29,600	$29,509	$91

1/ Recycling costs are assumed to be $300/ton.

Table 5-2. Generator Incremental Savings: Post-Regulatory Recycling vs. Baseline Landfilling Costs (Option 1)										
Generator Size (tons/year)			Distance to Recycler <200 Miles		Distance to Recycler 300 Miles		Distance to Recycler 600 Miles		Distance to Recycler 1,000 Miles	
	Distance to Landfill (miles)	Baseline Landfill Costs	Post-Reg. Rec. Costs 1/	Incremental Savings	Post-Reg. Rec. Costs 1/	Incremental Savings	Post-Reg. Rec. Costs 1/	Incremental Savings	Post-Reg. Rec. Costs 1/	Incremental Savings
5	100	$12,176	$4,208	$7,968	$2,819	$9,357	$3,557	$8,619	$4,520	$7,656
	200	$12,176	$4,208	$7,968	$2,819	$9,357	$3,557	$8,619	$4,520	$7,656
	400	$12,728	$4,208	$8,520	$2,819	$9,909	$3,557	$9,171	$4,520	$8,208
10	100	$12,216	$4,548	$7,668	$4,059	$8,157	$4,797	$7,419	$5,760	$6,456
	200	$12,216	$4,548	$7,668	$4,059	$8,157	$4,797	$7,419	$5,780	$6,436
	400	$12,768	$4,548	$8,220	$4,059	$8,709	$4,797	$7,971	$5,760	$7,008
20	100	$12,296	$7,628	$4,668	$7,139	$5,157	$7,877	$4,419	$8,840	$3,456
	200	$12,296	$7,628	$4,668	$7,139	$5,157	$7,877	$4,419	$8,840	$3,456
	400	$12,848	$7,628	$5,220	$7,139	$5,709	$7,877	$4,971	$8,840	$4,008
30	100	$13,226	$10,708	$2,518	$10,484	$2,742	$11,423	$1,803	$12,647	$579
	200	$13,226	$10,708	$2,518	$10,484	$2,742	$11,423	$1,803	$12,647	$579
	400	$13,778	$10,708	$3,070	$10,484	$3,294	$11,423	$2,355	$12,647	$1,131
40	100	$16,656	$13,979	$2,677	$13,979	$2,677	$15,231	$1,425	$16,862	($206)
	200	$16,656	$13,979	$2,677	$13,979	$2,677	$15,231	$1,425	$16,862	($206)
	400	$17,208	$13,979	$3,229	$13,979	$3,229	$15,231	$1,977	$16,862	$346
50	100	$20,086	$17,473	$2,613	$17,473	$2,613	$19,038	$1,048	$21,078	($992)

Table 5-2. Generator Incremental Savings: Post-Regulatory Recycling vs. Baseline Landfilling Costs (Option 1)										
Generator Size (tons/year)			Distance to Recycler <200 Miles		Distance to Recycler 300 Miles		Distance to Recycler 600 Miles		Distance to Recycler 1,000 Miles	
	Distance to Landfill (miles)	Baseline Landfill Costs	Post-Reg. Rec. Costs 1/	Incremental Savings	Post-Reg. Rec. Costs 1/	Incremental Savings	Post-Reg. Rec. Costs 1/	Incremental Savings	Post-Reg. Rec. Costs 1/	Incremental Savings
	200	$20,086	$17,473	$2,613	$17,473	$2,613	$19,038	$1,048	$21,078	($992)
	400	$20,638	$17,473	$3,165	$17,473	$3,165	$19,038	$1,600	$21,078	($440)
60	100	$23,436	$20,968	$2,468	$20,968	$2,468	$22,846	$590	$25,294	($1,858)
	200	$23,436	$20,968	$2,468	$20,968	$2,468	$22,846	$590	$25,294	($1,858)
	400	$23,988	$20,968	$3,020	$20,968	$3,020	$22,846	$1,142	$25,294	($1,306)
70	100	$26,706	$24,463	$2,243	$24,463	$2,243	$26,654	$52	$29,509	($2,803)
	200	$26,706	$24,463	$2,243	$24,463	$2,243	$26,654	$52	$29,509	($2,803)
	400	$27,258	$24,463	$2,795	$24,463	$2,795	$26,654	$604	$29,509	($2,251)

1/ Recycling costs are assumed to be $300/ton.

The estimated costs presented in Tables 5-1 and 5-2 were used for the different milage ranges. For example, the landfill distance range 0-150 miles was represented in the cost estimate based on 100 miles; i.e., 42 percent of the generators used landfills 150 or less miles away, which was represented by the cost estimates based on a distance of 100 miles. This is a simplifying assumption so that national estimates could be derived.

Recycling costs are estimated to range from $200 to $400 per ton. This range is likely to vary widely, and in some instances will be negative (i.e., when the metal credit exceeds the processing fee). Unfortunately there is limited information regarding what portion of the total amount of F006 generated waste is actually the most desirable for recycling. Inquiries were made with industry regarding how much of the universe of F006 waste actually has a positive value (i.e., recyclers would actually pay generators for the material). Unfortunately, contacts were unable (or unwilling) to respond with any specificity. Consequently, this analysis is based on a cost of $300/ton of F006 generated.

The impacts associated with the rule are presented in Table 5-3 for the F006 generators submitting waste generation information in the 1995 Biennial Report. In general, the impacts resulting from the regulation will have the greatest effect on smaller generators, including the smaller job shops. Overall, due to potential cost savings associated with the rule, the recycling rate of electroplaters generating less than 70.8 tons of F006 a year is expected to increase, ranging from 71 to 87 percent.

Two scenarios are presented in Table 5-3 to estimate the potential annual cost savings (1997$) due to increased post-regulatory recycling rates. As is evident from the two scenarios presented, savings to generators may result in two ways. First, the ability to accumulate a greater amount of waste will allow more generators to surpass minimum load charges and second, for many generators the number of loads (i.e., trips to a recycling facility during a given year) may be reduced, resulting in lower transportation and shipping costs. For the first scenario, lower bound recycling rate estimates range from 70 to 80 percent across different generator size categories resulting in a total cost savings estimate of $3.9 million per year. For the second scenario, upper bound recycling rate estimates range from 85 to 100 percent across different generator size categories resulting in a total cost savings estimate of $5.0 million per year. Total cost savings are estimated to range from $3.9 to $5.0 million annually on a before tax basis.

Table 5-3. Summary of Cost Impact Estimates and Changes in F006 Recycling Under Option 1 (1997$)								
Size Range (tons/yr)	**Number of Facilities**	**Total Generated (tons)**	**Number of Ongoing Recycling Facilities 1/**	**Avg. Facility Savings On-going Recycling 2/ ($facility/yr)**	**Number of Incremental Recycling Facilities**	**Avg. Facility Savings Incremental Recycling 3/ ($/facility/yr)**	**Post-Regulatory Recycling Rate (%)**	**Annual Total Cost Savings 6/ ($1000/yr)**
0.0-2.5	210	211	NE	NE	NE	NE	NE	NE
2.5-7.5	242	1,153	97	$6,860	97-145	$8,449	80-100 4/	1,482-1,890
7.6-12.5	168	1,685	67	$5,840	67-101	$7,429	80-100 4/	892-1,141
12.6-25.0	317	5,881	127	$3,440	127-190	$4,429	80-100 4/	998-1,279
25.1-35.0	148	4,427	59	$3,014	44-67	$1,852	70-85 5/	261-302
35.1-45.0	111	4,391	44	$2,309	25-38	$2,019	70-85 5/	153-180
45.1-55.0	91	4,573	36	$1,559	18-27	$2,049	70-85 5/	94-113
55.0-65.0	70	4,176	28	$810	14-21	$1,759	70-85 5/	47-60
65.0-70.8	47	2,790	38	$60	13-20	$1,390	70-85 5/	20-30
Total	1,395	29,287	496		405-609		71-87	3,948-4,995

NE - Not Estimated. Impacts for the smallest facilities are not estimated because of uncertainties regarding the transport of waste by these small generators, which will likely involve multiple pickups to reduce transport costs.

1/ The baseline recycling rate is estimated at 40% for all categories based on an assessment of BRS data.

2/ Baseline facility recycling costs minus post-regulatory recycling costs, weighted by the number of facilities in each distance category. The average incremental savings are calculated using the incremental savings estimates presented in Table 5-1, and percentage of facilities in each size category, as presented in Section 5.2.

3/ Baseline facility land disposal costs minus post-regulatory recycling costs, weighted by the number of facilities in each distance category. The average incremental savings are calculated using the incremental savings estimates presented in Table 5-2, and percentage of facilities in each size category, as presented in Section 5.2.

4/ Range estimate based on evaluation which indicates a cost advantage for recycling in all scenarios considered. However, given the uncertainties regarding waste quality and other factors 80% is assumed as a lower bound.

5/ Range estimate based on evaluation which indicates a cost advantage for recycling in most scenarios considered.

6/ As an example calculation, for the 2.5-7.5 size range, lower bound savings for an individual generator are calculated as follows:

Facility Savings Recycling to Recycling:
= number of ongoing recycling facilities x [(<200 mile fraction x <200 mile incremental facility savings) + (300 mile fraction x 300 mile incremental facility savings) + (600 mile fraction x 600 mile incremental facility savings) + (1,000 mile fraction x 1,000 mile incremental facility savings)]

= 97 x [(.2 x $4,168) + (.16 x $5,557) + (.31 x $7,035) + (.33 x $8,960)]

Facility Savings Incremental Recycling:
= lower bound number of incremental recycling facilities x <200 mile recycling fraction x [(100 mile baseline landfill fraction x 100 mile incremental facility savings) + (200 mile baseline landfill fraction x 200 mile incremental facility savings) + (400 mile baseline landfill fraction x 400 mile incremental facility savings) + ...The proceeding calculation would be repeated for the 300, 600, and 1,000 mile recycling distances]

=97 x .2 [(.42 x $7,968) + (.29 x $7,968) + (.29 x $8,520)....]

Annual Total Cost Savings:
= Facility Savings Recycling to Recycling + Facility Savings Incremental Recycling

$664,079 +$871,875 = $1,481,954

5.2.2 Economic Impact Analysis

Because this final rulemaking would result in cost savings to regulated entities rather than impose costs, no adverse economic impacts to these entities would result from this action. The magnitude of cost savings from this regulatory action can be expressed as a percentage of average firm revenues and profits. Because of the large number of electroplating facilities that conduct electroplating and the proprietary nature of individual firm financial information, an average or model firm is used in this analysis in lieu of actual firm data. In 1995, approximately 3,300 job shops had revenues of $5.8 billion and estimated profits of $180 million yielding an average of $1.8 million in revenue and $55,000 in profits per firm.[29] Under this final rulemaking, average facility savings of affected firms incurring savings estimated in Table 5-3 range between $1,200 and $8,400 per facility. So, while facility savings are less than one percent of an average plating firm's revenues, these savings would represent between 1 and 15 percent of firm profits. As mentioned above, facility savings would be the greatest to the smallest plating firms. These savings would be sufficient to cause a shift from landfilling of F006 waste to recycling for a substantial number of facilities.

5.3 Option 2 Findings

Impacts associated with Option 2, which allows the accumulation of F006 for 180 days (270 days in certain circumstances), up to a total quantity of 20,000 kilograms (22 tons) is presented in this section.

5.3.1 Estimated Cost Impacts and Increases in Recycling

Estimated costs for each of the facility sizes are presented in Tables 5-4 and 5-5. Costs are estimated consistent with Option 1, presented above.

The estimated costs presented in Tables 5-4 and 5-5 were used for the different milage ranges as described previously for Option 1. Recycling costs are also estimated to range from $200 to $400 per ton as in Option 1. The impacts associated with the rule allowing F006 accumulation for 180 days (or 270 days when recycling facilities are more than 200 miles distant) in amounts not exceeding 22 tons are presented in Table 5-6. The estimated recycling rate for electroplaters generating less than 88 tons of F006 per year is expected to increase to 72 to 89 percent. Total cost savings are estimated to range from $4.2 to $5.3 million annually on a before tax basis.

[29] U.S. EPA Office of Solid Waste And Emergency Response, Draft Regulatory Impact Analysis: Phase IV Land Disposal Restrictions - TC Organometallic Wastes,, December 15, 1997, p.2.

Table 5-4. Generator Incremental Savings: Post-Regulatory vs. Baseline Recycling Costs (Option 2)				
Generator Size (tons/year)	**Distance to Recycler (miles)**	**Baseline Recycling Costs 1/**	**Post-Regulatory Recycling Costs 1/**	**Incremental Savings**
5	<200	$8,376	$4,208	$4,168
	300	$8,376	$2,819	$5,557
	600	$10,592	$3,557	$7,035
	1,000	$13,480	$4,520	$8,960
10	<200	$8,416	$4,548	$3,868
	300	$8,416	$4,059	$4,357
	600	$10,632	$4,797	$5,835
	1,000	$13,520	$5,760	$7,760
20	<200	$9,096	$7,628	$1,468
	300	$9,096	$7,139	$1,957
	600	$11,312	$7,877	$3,435
	1,000	$14,200	$8,840	$5,360
30	<200	$12,176	$10,708	$1,468
	300	$12,176	$10,241	$1,935
	600	$14,392	$10,996	$3,396
	1,000	$17,280	$11,981	$5,299
40	<200	$15,256	$13,788	$1,468
	300	$15,256	$13,655	$1,601

Table 5-4. Generator Incremental Savings: Post-Regulatory vs. Baseline Recycling Costs (Option 2)				
Generator Size (tons/year)	**Distance to Recycler (miles)**	**Baseline Recycling Costs 1/**	**Post-Regulatory Recycling Costs 1/**	**Incremental Savings**
	600	$17,472	$14,662	$2,810
	1,000	$20,360	$15,975	$4,385
50	<200	$18,336	$17,068	$1,268
	300	$18,336	$17,068	$1,268
	600	$20,552	$18,327	$2,225
	1,000	$23,440	$19,968	$3,472
60	<200	$21,416	$20,482	$934
	300	$21,416	$20,482	$934
	600	$23,632	$21,993	$1,639
	1,000	$26,520	$23,962	$2,558
70	<200	$24,496	$23,895	$601
	300	$24,496	$23,895	$601
	600	$26,712	$25,658	$1,054
	1,000	$29,600	$27,955	$1,645
80	<200	$27,336	$27,309	$27
	300	$27,336	$27,309	$27
	600	$29,552	$29,324	$228
	1,000	$32,440	$31,949	$491

1/ Recycling costs are assumed to be $300/ton.

Table 5-5. Generator Incremental Savings: Post-Regulatory Recycling vs. Baseline Landfilling Costs (Option 2)										
Generator Size (tons/year)			Distance to Recycler <200 Miles		Distance to Recycler 300 Miles		Distance to Recycler 600 Miles		Distance to Recycler 1,000 Miles	
	Distance to Landfill (miles)	Baseline Landfill Costs	Post-Reg. Rec. Costs 1/	Incremental Savings	Post-Reg. Rec. Costs 1/	Incremental Savings	Post-Reg. Rec. Costs 1/	Incremental Savings	Post-Reg. Rec. Costs 1/	Incremental Savings
5	100	$12,176	$4,208	$7,968	$2,819	$9,357	$3,557	$8,619	$4,520	$7,656
	200	$12,176	$4,208	$7,968	$2,819	$9,357	$3,557	$8,619	$4,520	$7,656
	400	$12,728	$4,208	$8,520	$2,819	$9,909	$3,557	$9,171	$4,520	$8,208
10	100	$12,216	$4,548	$7,668	$4,059	$8,157	$4,797	$7,419	$5,760	$6,456
	200	$12,216	$4,548	$7,668	$4,059	$8,157	$4,797	$7,419	$5,780	$6,436
	400	$12,768	$4,548	$8,220	$4,059	$8,709	$4,797	$7,971	$5,760	$7,008
20	100	$12,296	$7,628	$4,668	$7,139	$5,157	$7,877	$4,419	$8,840	$3,456
	200	$12,296	$7,628	$4,668	$7,139	$5,157	$7,877	$4,419	$8,840	$3,456
	400	$12,848	$7,628	$5,220	$7,139	$5,709	$7,877	$4,971	$8,840	$4,008
30	100	$13,226	$10,708	$2,518	$10,241	$2,985	$10,996	$2,230	$11,981	$1,245
	200	$13,226	$10,708	$2,518	$10,241	$2,985	$10,996	$2,230	$11,981	$1,245
	400	$13,778	$10,708	$3,070	$10,241	$3,537	$10,996	$2,782	$11,981	$1,797
40	100	$16,656	$13,788	$2,868	$13,655	$3,001	$14,662	$1,994	$15,975	$681
	200	$16,656	$13,788	$2,868	$13,655	$3,001	$14,662	$1,994	$15,975	$681
	400	$17,208	$13,788	$3,420	$13,655	$3,553	$14,662	$2,546	$15,975	$1,233
50	100	$20,086	$17,068	$3,018	$17,068	$3,018	$18,327	$1,759	$19,968	$118

Table 5-5. Generator Incremental Savings: Post-Regulatory Recycling vs. Baseline Landfilling Costs (Option 2)										
Generator Size (tons/year)			**Distance to Recycler <200 Miles**		**Distance to Recycler 300 Miles**		**Distance to Recycler 600 Miles**		**Distance to Recycler 1,000 Miles**	
	Distance to Landfill (miles)	**Baseline Landfill Costs**	**Post-Reg. Rec. Costs 1/**	**Incremental Savings**	**Post-Reg. Rec. Costs 1/**	**Incremental Savings**	**Post-Reg. Rec. Costs 1/**	**Incremental Savings**	**Post-Reg. Rec. Costs 1/**	**Incremental Savings**
	200	$20,086	$17,068	$3,018	$17,068	$3,018	$18,327	$1,759	$19,968	$118
	400	$20,638	$17,068	$3,570	$17,068	$3,570	$18,327	$2,311	$19,968	$670
60	100	$23,436	$20,482	$2,954	$20,482	$2,954	$21,993	$1,443	$23,962	($526)
	200	$23,436	$20,482	$2,954	$20,482	$2,954	$21,993	$1,443	$23,962	($526)
	400	$23,988	$20,482	$3,506	$20,482	$3,506	$21,993	$1,995	$23,962	$26
70	100	$26,706	$23,895	$2,811	$23,895	$2,811	$25,658	$1,048	$27,955	($1,249)
	200	$26,706	$23,895	$2,811	$23,895	$2,811	$25,658	$1,048	$27,955	($1,249)
	400	$27,258	$23,895	$3,363	$23,895	$3,363	$25,658	$1,600	$27,955	($697)
80	100	$30,136	$27,309	$2,827	$27,309	$2,827	$29,324	$812	$31,949	($1,813)
	200	$30,136	$27,309	$2,827	$27,309	$2,827	$29,324	$812	$31,949	($1,813)
	400	$30,688	$27,309	$3,379	$27,309	$3,379	$29,324	$1,364	$31,949	($1,261)

1/ Recycling costs are assumed to be $300/ton.

Table 5-6. Summary of Cost Impact Estimates and Changes in F006 Recycling Under Option 2 (1997$)								
Size Range (tons/yr)	**Number of Facilities**	**Total Generated (tons)**	**Number of Ongoing Recycling Facilities 1/**	**Avg. Facility Savings On-going Recycling 2/ ($facility/yr)**	**Number of Incremental Recycling Facilities**	**Avg. Facility Savings Incremental Recycling 3/ ($/facility/yr)**	**Post-Regulatory Recycling Rate (%)**	**Annual Total Cost Savings ($1000/yr)**
0.0-2.5	210	211	NE	NE	NE	NE	NE	NE
2.5-7.5	242	1,153	97	$6,860	97-145	$8,449	80-100 4/	1,482-1,890
7.6-12.5	168	1,684	67	$5,840	67-101	$7,429	80-100 4/	991-1,141
12.6-25.0	317	5,881	127	$3,440	127-190	$4,429	80-100 4/	998-1,279
25.1-35.0	148	4,427	59	$3,405	44-67	$2,243	70-85 5/	301-350
35.1-45.0	111	4,391	44	$2,868	33-50	$2,057	70-85 5/	196-230
45.1-55.0	91	4,573	36	$2,292	27-41	$1,831	70-85 5/	133-158
55.1-65.0	70	4,176	28	$1,689	16-24	$2,117	70-85 5/	81-98
65.1-75.0	67	4,691	27	$1,086	13-20	$2,155	70-85 5/	58-73
75.1-88.0	59	4,789	24	$242	12-18	$2,055	70-85 5/	30-42
Total	1,483	35,976	509		436-656		72-89	4,171-5,264

NE - Not Estimated. Impacts for the smallest facilities are not estimated because of uncertainties regarding the transport of waste by these small generators, which will likely involve multiple pickups to reduce transport costs.

1/ The baseline recycling rate is estimated at 40% for all categories based on an assessment of BRS data.

2/ Baseline facility recycling costs minus post-regulatory recycling costs, weighted by the number of facilities in each distance category. The average incremental savings are calculated using the incremental savings estimates presented in Table 5-4, and percentage of facilities in each size category, as presented in Section 5.1.

3/ Baseline facility land disposal costs minus post-regulatory recycling costs, weighted by the number of facilities in each distance category. The average incremental savings are calculated using the incremental savings estimates presented in Table 5-5, and percentage of facilities in each size category, as presented in Section 5.1.

4/ Range estimate based on evaluation which indicates a cost advantage for recycling in all scenarios considered. However, given the uncertainties regarding waste quality and other factors (e.g, the ability of generators to achieve full truck loads through more than one generator's waste per truck or "milk runs") 80% is assumed as a lower bound. See Section 2.3 above for a complete listing of the factors resulting in the range used in this estimate.

5/ Range estimate based on evaluation which indicates a cost advantage for recycling in most scenarios considered.   Here because average facility savings among affected firms were less than smaller generators, a 70 percent lower bound is used.   Again, the range is used to account for the additional factors identified in Section 2.3 above that can affect a generator's decision whether to recycle or landfill.

5.3.2 Economic Impact Analysis

Because this final rulemaking would result in cost savings to regulated entities rather than impose costs, no adverse economic impacts to these entities would result from this action. The magnitude of cost savings from this regulatory action can be expressed as a percentage of average firm revenues and profits. Because of the large number of electroplating facilities that conduct electroplating and the proprietary nature of individual firm financial information, an average or model firm is used in this analysis in lieu of actual firm data. In 1995, approximately 3,300 job shops had revenues of $5.8 billion and estimated profits of $180 million yielding an average of $1.8 million in revenue and $55,000 in profits per firm.[30] Under this final rulemaking, average facility savings of affected firms incurring savings estimated in Table 5-6 range between $100 and $8,400 per facility. So, while facility savings are less than one percent of an average plating firm's revenues, these savings would represent between 0.2 and 15 percent of firm profits. As mentioned above, facility savings would be the greatest to the smallest plating firms. These savings would be sufficient to cause a shift from landfilling of F006 waste to recycling for a substantial number of facilities.

[30] U.S. EPA Office of Solid Waste And Emergency Response, Draft Regulatory Impact Analysis: Phase IV Land Disposal Restrictions - TC Organometallic Wastes,, December 15, 1997, p.2.

6.0 QUALITATIVE BENEFITS

Providing a 180/270 day length of time generators may accumulate F006 waste, makes it more economical for more generators to recycle F006 waste instead of placing it in a landfill. Increased recycling of F006 waste may result in a net benefit to both society and the environment. Some of the expected benefits include the following:

- **Landfill Capacity:** Approximately 23 million tons of hazardous waste are land disposed annually. In 1995, 1 million tons of hazardous waste were disposed of in landfills along with 208 million tons of municipal waste.[31] Available landfill space is limited and as overcapacity issues are eminent, any increase in recycling will lessen the future burden on landfills.

- **Resource Conservation:** The supply of metals used in electroplating processes is ultimately fixed by nature. Many metals are easily recycled and today recycled metals make up a large portion of the available metals supply. For instance, the U.S. Geological Survey reported that in 1996, 78 million metric tons of metals were recycled in the U.S. The value of these recycled metals was estimated to be approximately $18 billion.[32] As the U.S. Geological Survey states, "Recycling, a significant factor in the supply of many of the key metals used in our society, provides environmental benefits in terms of energy savings, reduced volumes of waste, and reduced emissions. These reductions, in turn, result in reduced disturbance to land, reduced pollution, and reduced energy use."[33]

- **Metal Recovery:** An increase in recycling of domestic metals will lessen the dependance of the United States on foreign metal supplies. In 1991, the United States ran a $9.8 billion balance of trade deficit for metal commodities.[34] Copper, nickel, and zinc, three of the most common metals recovered from F006 waste, accounted for more than $2 billion of this total. Additionally, several metal recyclers of F006 waste reported that metal recovery of nickel, chromium and zinc bearing secondary materials was more efficient in terms of conserving energy, and reducing solid waste residuals associated with primary metal/mineral production. Finally, in its <u>Report to Congress on Metal Recovery, Environmental Regulation and Hazardous Waste</u>, EPA reported that chromium, a

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[31] U.S. EPA, Office of Solid Waste and Emergency Response, "RCRA: Reducing Risk From Waste OSWER," EPA530-K-97-004, September 1997, pp 14-15.

[32] U.S. Geological Survey–Minerals Information, "Recycling–Metals," 1996, p.1.

[33] Ibid.

[34] Based on the difference between imports and exports of each commodity as reported in Jacqueline A. McClaskey and Stephen D. Smith, "Survey Methods and Statistical Summary of Nonfuel Minerals," U.S. Department of the Interior, Bureau of Mines, 1991. As reported, <u>supra</u>, Note 38, USEPA, p.134.

strategic metal,[35] is found in sources of secondary materials such as F006 waste. The report also indicates that these secondary materials are underutilized as a potential source of secondary chromium to reduce U.S. dependence on foreign primary sources.[36] [37]

[35] A strategic metal is a metal which is required for critical military and/or civilian use and for which the United States is dependent upon from vulnerable sources of supply. As reported, Borst, Paul A., "Recycling of Wastewater Treatment Sludges From Electroplating Operations, F006," USEPA, OSW.

[36] Supra, Note 38, pp. 138-139.

[37] Borst, Paul A., "Recycling of Wastewater Treatment Sludges From Electroplating Operations, F006," USEPA, OSW.

7.0 OTHER ADMINISTRATIVE REQUIREMENTS

This section describes the Agency's response to other rulemaking requirements established by statute and executive order, within the context of the final 180-day accumulation rule for F006 waste.

7.1 Environmental Justice

EPA is committed to addressing environmental justice concerns and is assuming a leadership role in environmental justice initiatives to enhance environmental quality for all residents of the United States. The Agency's goals are to ensure that no segment of the population, regardless of race, color, national origin, or income bears disproportionately high and adverse human health and environmental impacts as a result of EPA's policies, programs, and activities, and that all people live in clean and sustainable communities. In response to Executive Order 12898 and to concerns voiced by many groups outside the Agency, EPA's Office of Solid Waste and Emergency Response formed an Environmental Justice Task Force to analyze the array of environmental justice issues specific to waste programs and to develop an overall strategy to identify and address these issues (OSWER Directive No. 9200.3-17).

It is not certain whether the environmental problems addressed by the 180/270 day accumulation rule for F006 waste could disproportionately affect minority or low income communities, due to the location of some metal finishing operations. Metal finishing operations are distributed throughout the country and many are located within highly populated areas. Because the final rule retains requirements for F006 generators to store F006 waste in protective Subpart I tanks, Subpart I containers or Subpart DD container buildings, the Agency does not believe that this rule will increase risks from F006 waste. It is, therefore, not expected to result in any disproportionately negative impacts on minority or low income communities relative to affluent or non-minority communities. Similarly, because the accumulation units are protective, the rule is not expected to result in any increased risk to minority or low-income workers handling F006 waste relative to higher-wage or non-minority workers.

7.2 Unfunded Mandates Reform Act

Under Section 202 of the Unfunded Mandates Reform Act of 1995, signed into law on March 22, 1995, EPA must prepare a statement to accompany any rule for which the estimated costs to state, local, or tribal governments in the aggregate, or to the private sector, will be $100 million or more in any one year. Under Section 205, EPA must select the most cost-effective and least burdensome alternative that achieves the objective of the rule and is consistent with statutory requirements. Section 203 requires EPA to establish a plan for informing and advising any small governments that may be significantly affected by the rule.

An analysis of the costs and benefits of the final rule was conducted and it was determined that this rule does not include a federal mandate that may result in estimated costs of $100 million or more to either state, local, or tribal governments in the aggregate. The private sector also is not expected to incur costs exceeding $100 million per year in this RIA.

7.3 Protection of Children from Environmental Health Risks and Safety Risks

On April 21, 1997, the President signed an Executive Order (13045) entitled, "Protection of Children from Environmental Health Risks and Safety Risks." The Executive Order requires all economically significant rules[38] that concern an environmental health risk or safety risk that may disproportionately affect children to comply with requirements of the Executive Order. Because EPA does not consider today's final rule to be economically significant, it is not subject to Executive Order 13045. Because this rulemaking retains current container standards for generators accumulating hazardous wastes on-site without a permit (40 CFR §262.34), EPA believes that the 180/270 day accumulation period will not result in increased exposures to children. Generators that accumulate F006 waste on-site typically place the waste in containers such as 55 gallon drums or "super sacks"(sacks that are reinforced woven resin and designed to accommodate bulk shipments). The current container standards (40 CFR Part 265, Subpart I) referenced in the generator regulations (40 CFR §262.34) require that waste handlers, including generators, to keep containers in good condition (subject to remedial action if leaks are found), have containers closed during usage except when adding or removing waste and inspect the containers at least weekly. In addition, for these containers, waste handlers are required under Subpart I to comply with Subpart CC air emission standards for containers. 40 CFR §§265.178, 265.1087. EPA believes that these container requirements are protective to minimize the likelihood of exposure to hazardous waste managed in these units. For these reasons, the environmental health risks or safety risks addressed by this action do not have a disproportionate effect on children.

[38] An economically significant rule is defined by Executive Order 12866 as any rulemaking that has an annual effect on the economy of $100 million or more, or would adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health, or safety, or State, local, or tribal governments or communities.

8.0 CONCLUSION

This final regulatory action may provide between $4.2 million and $5.3 million in cost savings due to an increase in the accumulation time limit to 180 days and in certain instances, up to 270 days for F006 waste generators. These cost savings will primarily benefit the smallest electroplating operations due to a decrease in transportation costs that will result from a reduction in the frequency of shipments and the shipment of fuller loads that exceed minimum recycling and transporting charges on a per unit basis. These cost savings will lead to an increase in the amount of F006 waste that is recycled. In order to ensure that on-site accumulation of F006 waste is protective of human health and the environment, the management standards for the 180 and 270-day on-site accumulation of F006 waste would be the same as those that currently apply to 90-day accumulation. Benefits resulting from this final rulemaking include conservation of natural resources, conservation of hazardous waste landfill capacity and increased metal recovery including strategic metals.

APPENDIX A

TRANSPORTATION UNIT COSTS (Example Based on a 15 Ton Maximum Truck Load Size) (Assumed Multiple Stops to Create Full Load))																
Quarterly Generation Rate (tons)	**Baseline Transport**								**Post-Regulatory Transport**							
	Load Size (%) [Load Share (%)]	**Load Unit Cost ($/load) ***	**Load Freq. (loads/yr)**	**Transportation Unit Cost (full load)**					**Load Size (%) [Load Share (%)]**	**Load Unit Cost ($/load) ***	**Load Freq. (loads/yr)**	**Transportation Unit Cost (full load)**				
				Min. $/load	200-400 $/mi	400-800 $/mi	800-1600 $/mi	> 1600 $/mi				Min. $/load	200-400 $/mi	400-800 $/mi	800-1600 $/mi	> 1600 $/mi
Incremental Compliance Costs Incurred by the Following Generators																
<3.3	44 [50]	240 (6 hrs.) 1 extra stop	4	752 + 125	(X + 50 mi.) * 2.40	(X + 50 mi.) * 2.14	(X + 50 mi) * 2.03	(X + 50 mi.) * 1.92	44 [50]	240 (6 hrs.) 1 extra stop	2	752 + 125	(X + 50 mi) * 2.40	(X + 50 mi) * 2.14	(X + 50 mi) * 2.03	(X + 50 mi) * 1.92
3.3 - 7.5 (<200 mi.)	25 [33]	300 (7.5 hrs.) 2 extra stops	4	752 + 250	(X + 100 mi) * 2.40	(X + 100 mi.) * 2.14	(X + 100 mi.) * 2.03	(X + 100 mi.) * 1.92	50 [50]	240 (6 hrs.) 1 extra stop	2	752 + 125	(X + 50 mi) * 2.40	NA	NA	NA
3.3 - 7.5 (>200 mi.)	25 [25]	400 (10 hrs.) 3 extra stops	4	752 + 375	(X + 150 mi) * 2.40	(X + 150 mi) * 2.14	(X + 150 mi) * 2.03	(X + 150 mi) * 1.92	75 [50]	240 (6 hrs.) 1 extra stop	1.33	752 + 125	NA	(X + 50 mi) * 2.14	(X + 50 mi) * 2.03	(X + 50 mi) * 1.92

Appendix B

Transportation Cost Model Calibration

[Not Available in Electronic Format]